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#### REMARKS

##### I. Status of Claims

Without prejudice, the claims have been amended to clarify the subject matter of the applicants' invention. Specifically, the subject matter of claim 17 has been incorporated into claim 16 to clarify the orientation of the locations of the V-grooves and the fiducial. The dependence of claim 5 has been changed to claim 1. No new matter has been added.

##### II. Drawings

The Examiner has maintained his objection to the drawings, stating that the drawings must show every feature of the invention specified in the claims. Specifically, the examiner requested that either the second optical component comprising a substrate and all the method steps in preparing the first optical component for incorporation into an optical subassembly be shown in a drawing, or the features must be canceled from the claims.

Although Applicants submit that such a requirement is beyond the requirements of 37 C.F.R. §1.83(a), new Figs. 5 and 6 have nevertheless been provided to satisfy the Examiner's request. Specifically, Fig. 5 is a modified version of Figure 1 in which the second optical component is depicted as a substrate-type optical component, essentially the same as the first optical component. Support for this drawing can be found in the specification as follows:

The second optical component may be a substrate-type component (just like the first optical component described above and thus the description of the first optical component above applies to the second optical component in its entirety)

(see page 11, lines 11-13). Essentially the same language that was used for describing the first optical component with respect to Figure 1 has been reiterated with respect to Figure 5.

In Figs. 6(a)-(f), various stages of the preparation process for the first optical component are depicted schematically. These figures were created based on the description of the process provided in the specification, which has also been amended to reference these figures.

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Figs. 5 and 6 are being submitted informally at this time but will be formalized if found acceptable by the examiner.

Applicants submit that this amendment addresses the Examiners concern, and more than satisfies the requirements under 37 C.F.R. §1.83(a).

No new matter has been added.

### **III. Specification**

The Examiner found that the title of the invention was not descriptive. In response, Applicants have amended the title to read "OPTICAL BENCH HAVING V-GROOVE FOR ALIGNING OPTICAL COMPONENTS." If this title is not satisfactory, Applicants respectfully request that the Examiner propose a title that he believes is sufficiently descriptive.

### **IV. Matters of Formality**

The Examiner rejected Claims 5-7 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Specifically, the Examiner stated that Claims 5-7 are dependent from a cancelled claim. In response, Applicant has amended Claims 5 to depend from independent claim 1. Regarding Claim 7 the Examiner also stated that the term "are optically connector" is improper and does not make sense. In response, Applicants have amended the claim to read "are optically connected" which addresses the Examiner's concern.

### **V. Prior Art Rejections**

The Examiner rejected Claims 16, and 18-20 under 35 U.S.C. §102(b) as being anticipated by Takemura (JP 2001-215370). In supporting this rejection, the Examiner states simply that Takemura discloses "a method of preparing a first optical component [comprising] . . . inverting the first optical component in an upwardly facing v-groove of the platform such that the first optical component supported by the platform solely by the contact of the sides against the walls."

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The examiner rejected claim 17 under 35 U.S.C. §103(a) as being unpatentable over Takemura in view of Uekawa (US Patent No. 6,934,449). Specifically, the examiner admitted that Takemura does not disclose a photolithography steps as claims, but indicated that Uekawa teaching defining parts by a photolithography process. The examiner concluded that it would have been obvious to define the parts in Takemura "to efficiently and cost-effectively define such elements."

The Examiner rejected Claims 1, 3, 4, 8-11, 13-15 and 23 under 35 U.S.C. §103(a) as being unpatentable over Heinen, et al. (U.S. Patent No. 4,768,199) in view of Matsumoto (U.S. Patent No. 5,849,204). In supporting this rejection, the Examiner states that "Heinen discloses a first optical component (2) having a substrate with a downward facing reference surface and two sides 8, 9, each side being beveled at a certain pitch outwardly from the reference surface and comprising at least one optical element (7) secured to the reference surface, the optical element having a first optical axis (at 7) . . . ."

In response, Applicants respectfully submit that Heinen, Matsumoto, Takemura, or Uekawa, alone or in combination, fail to teach or suggest the claimed invention.

**A. The combination of Heinen and Matsumoto fails to suggest a first optical component having a substrate with a reference surface and a first optical element secured thereto.**

Claim 1 is patentably distinct over the combination of Heinen and Matsumoto since, among other things, it specifically recites that the first component comprises a substrate having a downward-facing *reference surface* from which two sides bevel outwardly and on which the optical element is secured. Thus, the claim requires a reference surface that must meet two criteria: (1) it must be a surface in which two beveled sides extend outwardly, and (2) it must be a surface on which an optical element is secured. This is an important feature of the claimed invention.

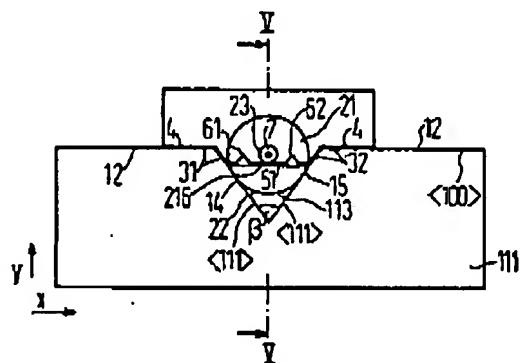
Specifically, by virtue of the beveled sides extending outwardly from it, the reference surface is precisely positioned in the optical assembly when the first optical component is disposed within the V-groove of the platform. Such a precisely-positioned surface provides an excellent surface on which to secure one or more optical elements such that they are precisely aligned within the optical assembly. Neither Heinen nor Matsumoto suggest this configuration.

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First, contrary to the Examiner's characterization, Heinen does not disclose a first optical component having a reference surface on which an optical element is mounted.



As shown above, Heinen discloses positioning a laser chip 2, which is flipped and disposed within a v-groove of a platform. It does not disclose a downward-facing reference surface to which the optical element is secured. Even if the mesa ridge 5 were construed as the "reference surface" from which the lateral faces 8, 9 extend, the "optical element 7," as the Examiner characterizes it, could not be construed as being secured to that surface. That is, the optical element 7, which is really the active zone of the mesa ridge, cannot define the reference surface while being secured to it.

Furthermore, it is worthwhile to mention that using the mesa ridge to support and align the laser chip 2 as shown in Heinen, is likely to be problematic since external pressures on the mesa ridge may diminish the laser's performance. The optical assembly of the claimed invention, however, avoids this problem by using a substrate with the reference surface to support the optical element as claimed.

It is also worthwhile to mention that, in the parlance of the specification, chip 2 of Heinen would be the first optical *element* and *not* the first optical component. That is, according to the present invention, chip 2 would be inverted and mounted on the reference surface of a larger substrate to form the first optical component, which, in turn, would be inverted and seated in yet a larger platform having a v-groove.

With respect to Matsumoto, the claims recite that the optical component has a downward-facing reference surface in the optical subassembly upon which is mounted an optical element. No such feature is found in Matsumoto. *To the contrary,*

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Matsumoto discloses a substrate that is configured to be disposed with the optical element facing upward as shown below:

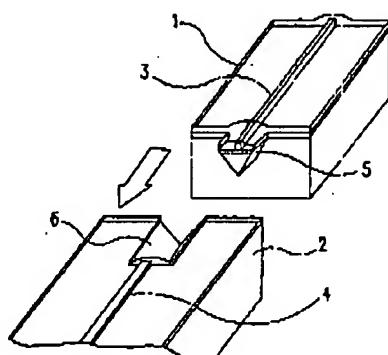


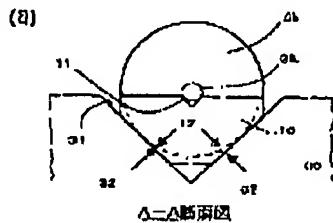
FIG. 3A

It is inconceivable how this configuration could be altered such that the optical axis in waveguide 3 would be defined in an optical element mounted on a downward-facing reference surface. Indeed, there is no likelihood of success in modifying Matsumoto in accordance with the claimed invention.

Since the combination of Matsumoto and Heinen fails to disclose a first optical component having a substrate with a reference surface, from which the beveled sides extend outwardly, and on which the optical element is secured, the rejection should be withdrawn and the claims allowed.

**B. Takemura does not disclose inverting the first optical component in an upwardly-facing V-groove of a platform.**

Takemura, like Matsumoto, fails to disclose a downward-facing reference surface on which is mounted an optical element having an optical axis. To the contrary, as shown below, the optical axis is on the top surface of the optical component 10 in contrast to the claimed invention.



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It is inconceivable how one would invert the optical component 10 and place it in the platform 30. Indeed, the optical component of Takemura is clearly designed to be installed in the platform 30 such that the optical element resides on an upward-facing surface, rather than on a downward-facing surface as in the claimed invention. Therefore, Takemura fails to teach or even suggest the step of "inverting the first optical component in an upwardly-facing V-groove of a platform." (Although this argument was raised in Applicants' previous reply, the Examiner has seemingly ignored it.)

**C. The combination of Takemura and Uekawa fails to teach or suggest a method of preparing a first optical component in which the v-grooves and fiducial are defined in a single step**

Modifying Takemura to define the location of the V-grooves and the fiducial in a single photolithography step would destroy its principle of operation. It is well established in US patent law that there can be no motivation to modify a reference if that modification would destroy the principle of operation of the reference.

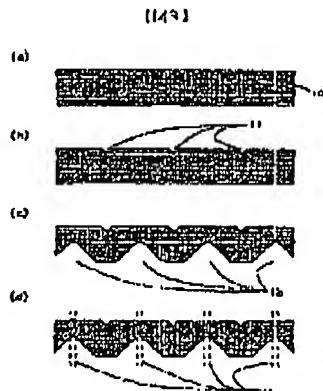
Here, Claim 16, as amended, recites that the locations of v-grooves and the fiducial are defined on the wafer during a single photolithography step. This is important to the claimed invention. Specifically, as stated on page 9, line 25 of the specification:

The present invention is particularly well suited for the manufacture of such a component since all the critical dimensions may be defined in a single photolithography step. That is, during the step in which the v-grooves are defined in the silicon wafer... a fiducial for locating the optical element 9 may be defined on the substrate 52. Thus, the critical dimensions of the optical axis 10a from sides 6a to 6b can effectively be accomplished in a single step thereby eliminating tolerance build up and simplifying manufacturing.

Therefore, by defining the location of the v-grooves and fiducial in the same step, the claimed invention provides a simpler and more precise process for manufacturing the first optical component.

In Takemura, the parallel v-grooves are on an opposite side of the wafer from the fiducial. This is apparent in Fig. 3 in which steps H and O clearly show forming the fiducials 11 on one side of the wafer 10, and then the V-grooves 12 on the other.

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It would be impossible to define the locations of the fiducials 11 and v-grooves 12 in a single lithography step since they are on different sides. That is, it is well known in photolithography that a mask is applied to the wafer surface to define the location of certain features on that surface. Obviously, if the features are on opposite sides of the wafer, a single masking process cannot be used. Furthermore, although Uekawa discloses defining parts by photolithography, it does not disclose defining the v-grooves and the fiducial in a single photolithography step. Moreover, as mentioned above, such a step is impossible in Takemura in which the v-grooves and the fiducials are on different sides of the wafer. Accordingly, since a single lithography step cannot be performed on Takemura without drastically altering its teachings, the rejection should be withdrawn and the claim, as amended, allowed.

Since none of the cited references teaches or suggests the claimed invention as amended, it is respectfully requested that the rejections be withdrawn and the claims allowed.

Respectfully submitted,

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